

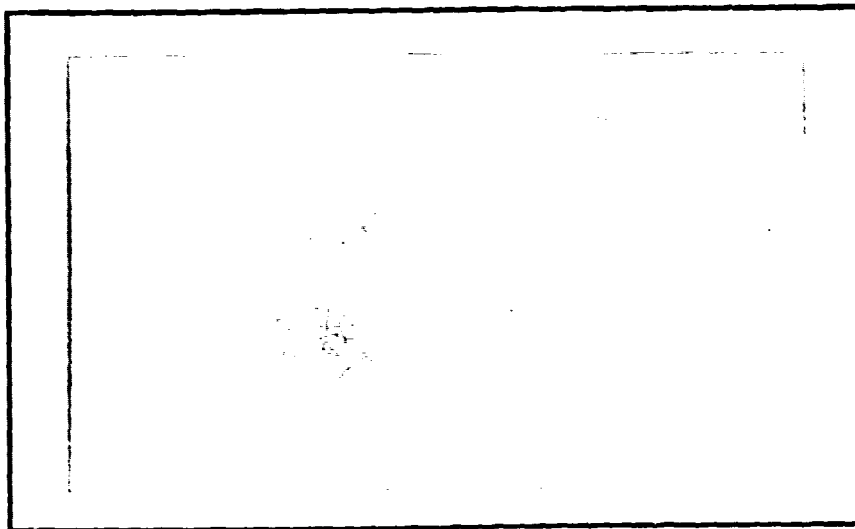
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— CR-171 901

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(NASA-CR-171901) TEMPUS: SIMULATING  
PERSONNEL AND TASKS IN A 3-D ENVIRONMENT  
Final Report (Pennsylvania Univ.) 18 p  
HC A02/MF A01

N86-10785

CSSL 05H

Unclas  
G3/54 27496



**UNIVERSITY of PENNSYLVANIA**  
*The Moore School of Electrical Engineering*  
PHILADELPHIA, PENNSYLVANIA 19104



**TEMPUS:  
Simulating Personnel and Tasks  
in a 3-D Environment**

**Final Report**

**May 31, 1985**

**NASA Contract No. NAS9-10634**

**Norman L. Badler  
Jonathan D. Korein**

**Department of Computer and Information Science**

**Moore School D2**

**University of Pennsylvania**

**Philadelphia, PA 19104**

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## **Final Report Summary**

This document serves as a cover and transmittal letter to NASA JSC of the final reports required under Contract NAS9-16634. We review the required end item products and refer to the companion documents.

### **1. Advanced Graphics**

The latest TEMPUS installation occurred in March, 1985. Another update is slated for early June, 1985. An updated User's Manual is in preparation and will be delivered approximately mid-June, 1985. NASA JSC has full source code listings and internal documentation for installed software. NASA JSC staff has received instruction in the use of TEMPUS. Telephone consultations have augmented on-site instruction.

### **2. User Interface Enhancement**

This report is provided under the title *User Interface Enhancement Report*.

### **3. Interfaces and Exchange Systems**

The applicability of IGES as a database standard was investigated and found deficient at this time. The observations and conclusions have been incorporated into the *System Integration Report* instead.

### **4. Biodynamics**

The four reports in this area are provided separately under three titles *Motion Analysis Report*, *Strength Modeling Report*, and *Zero-Gravity Motion Studies*. The report on *Reach Kinematics* is embedded in both the motion analysis and the strength modeling reports. It was felt that there was insufficient information available to produce a substantial document in this area and that the relevant information was already adequately described elsewhere in the other reports.

### **5. System Integration**

This report is provided under the title *System Integration Report*.

### **6. Equipment**

Equipment purchased under NAS9-16634 is recognized to be the property of NASA. We will be happy to retain this equipment to continue TEMPUS development as long as the contract monitor is agreeable.

## 7. Summary of Scientific Accomplishments

A number of scientific papers, theses, and one book have been generated by the TEMPUS project. A summary of these research contributions appears here.

1. A Geometric Investigation of Reach, MIT Press, Cambridge, MA, 1985 (James U. Korein).
2. "Positioning and animating human figures in a task-oriented environment," to appear in The Visual Computer: The International Journal of Computer Graphics, 1985 (Norman I. Badler, Jon Korein, James U. Korein, Gerald Radack, Lynne S. Brotman).
3. "Parametric keyframe interpolation incorporating kinetic adjustment and phrasing control," to appear in Computer Graphics 19, Jul. 1985 (Scott N. Steketee and Norman I. Badler).
4. "The window controller," to appear in ACM Transactions on Graphics, 1985 (Norman I. Badler and Tamar E. Granor).
5. "GUIDE: Graphical User Interface Development Environment," Granor). Trends and Applications Conference, IEEE, 1985 (Tamar E. Granor and Norman I. Badler).
6. "Hierarchical reasoning: Simulating complex processes over multiple levels of abstraction," First Annual Workshop on Robotics and Expert Systems, Instrument Society of America, 1985 (Paul Fishwick and Norman I. Badler).
7. "TEMPUS: A system for the design and simulation of human figures in a task-oriented environment," First Annual Workshop on Robotics and Expert Systems, Instrument Society of America, 1985 (Norman I. Badler, Jon Korein, James Korein, Gerry Radack, Lynne S. Brotman).
8. "Generating soft shadows with a depth-buffer algorithm," IEEE Computer Graphics and Applications, Oct. 1984 (Lynne S. Brotman and Norman I. Badler).
9. "Temporal anti-aliasing in computer generated animation," Computer Graphics 17(3), July 1983, pp. 377-388 (Jon Korein and Norman I. Badler).
10. "Techniques for goal-directed movement," IEEE Computer Graphics and Applications, Nov. 1982, pp. 71-81 (James U. Korein and Norman I. Badler).
11. "The Computer Graphics Scene in America," Proc. Eurographics '84 Conf., Copenhagen, Denmark (Norman I. Badler and Ingrid Carlbom), invited.
12. "Modeling and animating the human form," (Abstract only, invited) Proc. Graphics Interface Conference 1984 (Norman I. Badler).
13. "TEMPUS: A system for the design and simulation of mobile agents in a workstation and task environment," Proc. Trends and Applications Conference, IEEE, 1983, pp. 263-269 (Norman I. Badler, Bonnie L. Webber, James U. Korein, and Jon D. Korein).

## 8. Summary of Personnel

NASA Contract NAS9-16634 has helped support a number of individuals who have, by virtue of their degrees and publications, contributed to scientific and technical knowledge. Their efforts on TEMPUS are gratefully acknowledged. In addition, the TEMPUS project has provided interesting and challenging problems for many other, non-supported students, both graduate and undergraduate. The list of people is long but worth mentioning.

1. Jonathan D. Korein: Research Specialist.
2. Craig Meyer. System Programmer.
3. Philip Lee: PhD (expected), Strength and dynamics models.
4. Paul Fishwick: PhD 1986 (expected), *Hierarchical Reasoning*.
5. Tamar Granor: PhD 1985 (expected), *GUIDE: Graphical User Interface Development Environment*.
6. Stephen Platt: PhD 1985 (expected), *Realistic manipulation and animation of facial expressions*.
7. Gerald Radack: PhD 1984, *Local matching of surfaces using boundary-centered radial decomposition*.
8. James Korein: PhD 1984, *A geometric investigation of reach*.
9. Kamran Manoochehri: MSE 1985, Graphics for TEMPUS.
10. Barry Hunter: MSE 1985, Crow's system on the IRIS 1400.
11. Jeff Gangel: MSE 1985, "Checklist processing in TEMPUS."
12. Jane Rovins: MSE 1985, "The TEMPUS animator."
13. Alf Newlin: MSE 1985, Reach workspaces.
14. Skona Libowitz: MSE 1985, Checklist parser design.
15. Scott Steketee: MSE 1984, "Parametric keyframe interpolation incorporating kinetic adjustment and phrasing control."
16. S. David Eisenberg: MSE 1984, "Synchronizing animation to sound."
17. Lynne Shapiro Brotman: MSE 1984, "A method for generating shadows with an umbra and penumbra in computer generated images."
18. Marion Hamermesh: MSE 1984, TEMPUS animation system.
19. Douglas Bloom: MSE 1983, "A user-oriented interface control of an interactive computer graphics system."
20. Luke Weinstein: MSE 1983, "A menu driven user interface."

21. Frank Ganis: MSE 1983, SurfsUp.
22. Cheryl McNally: MSE 1983, SurfsUp and spherical polygons.
23. James Schardt: MSE 1983, CORE maintenance.
24. Jeffrey Beale: BSE 1985, Torso bending and breathing.
25. Brian Barr: BSE 1985, TEMPUS-Crow system interface.
26. Sui Wong: BSE 1985, Human strength models.
27. Nina Taft: BSE 1985, Articulated body dynamics in free-fall.
28. David Sirkin: BSE 1985, A keyframe animator.
29. Graham Walters: BSE 1985, Real-time animation playback.
30. Joel Sackman: BSE 1985, Improvements to TEMPUS menu system.
31. Marcus Bryan: BSE 1985, Sound system playback.
32. Dan Petreanu: BSE 1985, Body-object and object-object clearance computation.
33. Joe Salvador: BSE 1985, Design of dynamics adjustment in TEMPUS animator.
34. Jon Hanover: BSE 1985, A window manager for CORE.
35. Glenn Fala: BSE 1985, Checklist parser.
36. Carolyn Brown: BSE 1984, Polybody.
37. David Turvene: BSE 1984, Workstation hierarchy menus
38. Jim Jeletic: BSE 1984, Reference frames.
39. Mukul Agrawala: BSE 1984, Path planning and collision detection.
40. Duc Nguyen: BSE 1984, Texture generation.
41. Mike Mahoney: BSE 1984, Orientation reach.
42. Young-Ho Kwon: BSE 1984, Polhemus interface to CORE.
43. Gwen Shields: BSE 1984, Checklist parser design.
44. Jonathan Cohen: BSE 1983, Grinnell driver.
45. John Hagan: BSE 1983, CORE maintenance.



**9. Accounting**

The final accounting sheets for NAS9-16634 from the University of Pennsylvania account system follow.

EXP. DATE 06/85

DEPT NO. 11177 JUN 1982 JUN 1985

BADLER, N  
BA W60 TOWNE BLD  
GEO. LOC.=02 DEPT.=11177

CENTER=13

SUMMARY REPORT OF  
GRANT AND CONTRACT EXPENDITURES  
IN WHOLE DOLLARS, FOR 03/85

PURPOSE = 01 ACC PAGE 1

SUB CODE	DESCRIPTION	ORIGINAL PROJECT BUDGET	CURRENT PROJECT BUDGET	CURR. MO.	FYTD	PTD	COMMITMENTS	ENCUMBRANCES	EXP-BBA TO BUDGET	% ACTUAL
100	RESEARCH SPECIAL	30,343	30,343		10,804	36,704			5,361-	120
105	CLERICAL	6,265	6,265		321	6,585			320-	108
120	PROFESSOR	170	170			290			120-	170
123	ASSOC PROF	4,837	4,837			7,746			2,909-	160
131	SUMMER RES	14,111	14,111			14,111				100
136	RESEARCH FELLOW	41,587	46,323		13,500	50,567			4,244-	109
144						156			156-	
150	A 3	234	234			234				98
151	SECRETARY	6,255	6,255		83	6,337			82-	101
152	CLER	1,610	1,610			133			1,477	8
185	PART-TIME STUDEN	15,150	15,150		1,333	12,575			2,575	83
190	EB FULL-TIME	18,182	18,182		3,225	20,309			2,147-	111
194	EB PART TIME	1,432	1,432		140	1,177			2,285	82
	PERSONNEL SVS	140,136	144,892		29,205	156,925			12,033-	108
200	TRAVEL	10,000	11,700		1,693	11,465			235	97
210	OFFICE SUPPLIES	300	300		100	210			90	70
211	RSCH SUPPLIES	8,113	7,613		205	2,576		100	4,937	35
213	RSCH SUPPLIES	88	88			88				100
215	SUPPLIES	50	50			60				100
229	TUITION	50,675	50,675		2,440	50,330			345	99
232	MAINTENANCE	7,812	6,612			4,812		121	1,678	74
233	NON-UNIV TRAVEL	381	381			381				100
243	COMPUTER	27,987	27,987			27,467			500	98
260	EQUIP	134,868	127,065			126,584		500	1	99
281	PUBLICATIONS	103	103			103				100
288	DUPPLICATING	2,126	2,126		17	1,689			437	79
290	MISC	800	800			800				100
292	POSTAGE	1,432	1,432		306	1,174			258	81
293	TELE	250	250		2	12			238	4
	OTHER EXP ST	244,972	237,172		4,763	227,731		721	8,719	96
302	TELE	249	249		697	858			609-	344
304	PHY PLANT	55	55			55				100
306	MAIL	100	100			15			85	14
	UNIV SV ST	404	404		697	929			525-	229
	TOTAL DIR EXP	385,512	382,468		34,665	385,585		721	3,838-	101
404						150-			150	

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F INDICATES ACCOUNT IS FROZEN AND L INDICATES A DETAIL LINE ITEM ACCOUNT

EXP. DATE 06/85 DEPT NO. 11177 JUN 1982 JUN 1985

BADLER, N  
BA M60 TOWNE BLD  
GEO. LOC.-D2 DEPT.-11177

CENTER-13

SUMMARY REPORT OF  
GRANT AND CONTRACT EXPENDITURES  
IN WHOLE DOLLARS, FOR 03/85

PURPOSE - 01 ACC PAGE 2

SUB CODE	DESCRIPTION	ORIGINAL PROJECT BUDGET	CURRENT PROJECT BUDGET	-----A-----C-----T-----U-----A-----L-----				% ACTUAL EXP-BBA TO BUDGET
				CURR. MO.	FYTD	PTD	COMMITMENTS ENCUMBRANCES	
410	OVERHEAD	129,629	132,673		18,461	133,066		393- 100
*TOTALS*		515,141	515,141		53,126	518,501	721	4,081- 100

CURRENT MONTH TRANSACTIONS ARE ON A SEPARATE PAGE. QUESTIONS CONCERNING THIS REPORT AND/OR TRANSACTIONS SHOULD BE BROUGHT TO THE ATTENTION OF RESEARCH ACCOUNTING FOR GRANTS AND CONTRACTS; AND GENERAL ACCOUNTING FOR ALL ELSE.

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NAS9 16634  
5-22804

UNIVERSITY OF PENNSYLVANIA ACCOUNTING SYSTEM REPORT

PAGE 4485

COMPUTER DATE 03/30/85  
TIME OF DAY 12:26:21

F INDICATES ACCOUNT IS FROZEN AND L INDICATES A DETAIL LINE ITEM ACCOUNT

EXP. DATE 06/85

DEPT NO. 11177 JUN 1982 JUN 1985

BADLER IN  
BA M60 TOWNE BLD  
GEO. LOC.-02 DEPT.-11177

CENTER-13

OPEN COMMITMENT STATUS  
FOR 03/85

PURPOSE = 01 ACC PAGE 3

ACCOUNT	REF	DATE	DESCRIPTION	ORIGINAL AMOUNT	CURRENT	AMOUNT	LAST ACT	REF NO
5-22804-211	E092355	09/06/84	GRINNELL SYSTEMS	100.00		100.00	09/06/84	
5-22804-232	E085755	07/23/84	DIGITAL	121.44		121.44	07/23/84	
5-22804-260	E092355	09/06/84	GRINDEL SYSTEMS	500.00		500.00	09/06/84	
* ACCOUNT TOTAL *				0.00		0.00		
* ACCOUNT TOTAL *				721.44		721.44		

COMMITMENT TOTALS  
ENCUMBRANCE TOTALS

DEPT. NO. 11177

BADLER N EXP. DATE 06/30/85 PURPOSE-01

BA M60 TOWNE BLDG

GEO. LOC.-02 DEPT. 11177

CENTER-13

REPORT OF EXPENDITURE TRANSACTIONS FOR 03/31

SUB CODE	DESCRIPTION	DATE	REF NUMBER	TRANS IDENTIFICATION	BUDGET ENTRIES	CURRENT EXPENDED	COMMITMENTS	ENCUMBRANCES	FTD PAYROLL
100	KOREIN, JONATHAN	12/31	066383458	41-000001					12,724.98
	KOREIN J	12/31	066383458	41-000008					2,120.83-
100	CM TOTAL RESEARCH SPECIAL								10,604.15
105	TAYLOR-WILKINSON	09/30	199186759	41-000001					320.64
105	CM TOTAL CLERICAL								320.64
136	LIBOWITZ, SKONA	12/31	023424440	41-000001					3,000.00
	GANGEL, JEFFREY S	12/31	125426657	41-000001					4,999.98
	FISHWICK, PAUL AN	12/31	17485334	41-000001					5,499.98
136	CM TOTAL RESEARCH F Y								13,499.94
151	SIMONDS, ELAINE	07/01	211384170	41-000003					208.88
	SIMONS E	08/12	211384170	41-000028					84.20-
	SIMONS E	09/23	211384170	41-000048					42.10-
151	CM TOTAL SECRETARY								82.56
185	ROVINS, JANE	02/17	198465759	41-000004					1,312.50
	KATZ, LAURI ANNE	10/21	262780097	41-000004					20.00
185	CM TOTAL PART-TIME STUDEN								1,332.50
190	CM TOTAL EB FULL-TIME								
194	CM TOTAL EB PART TIME								
200	CM TOTAL TRAVEL								
210	CM TOTAL OFFICE SUPPLIES								
211	CM TOTAL RSCH SUPPLIES								
229	CM TOTAL TUITION								
288	CM TOTAL DUPLICATING								
292	CM TOTAL POSTAGE								
293	CM TOTAL TELE								
302	CM TOTAL TELE								
410	CM TOTAL OVERHEAD								

\*\*\* ACCOUNT TOTAL \*\*\*

25,839.79

0.00

0.00

0.00

0.00

EXP. DATE 06/30/85 PURPOSE=01

BADLER,N  
BA MGO TOWNE BLDG  
GEO. LOC.=02 DEPT.=11177

REPORT OF EXPENDITURE TRANSACTIONS FOR 03/31

DEPT. NO. 11177

MONTHLY CERTIFICATIONS HAVE BEEN REPLACED BY PERSONNEL ACTIVITY REPORTS.

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EXP. DATE 06/85

DEPT NO. 11177 JUN 1982 JUN 1985

BADLER, N  
BA M60 TOWNE BLD  
GEO. LOC. D2 DEPT. 11177 CENTER=13

SUMMARY REPORT OF  
GRANT AND CONTRACT EXPENDITURES  
IN WHOLE DOLLARS. FOR 04/85

PURPOSE = 01 ACC PAGE 1

SUB CODE	DESCRIPTION	ORIGINAL PROJECT BUDGET	CURRENT PROJECT BUDGET	CURR. MO.	FYTD	PTD	COMMITMENTS	ENCUMBRANCES	EXP-BBA TO BUDGET	% ACTUAL
100	RESEARCH SPECIAL	30,343	30,343	1,767-	8,837	34,937			4,594-	115
105	CLERICAL	6,265	6,265		321	6,585			320-	105
120	PROFESSOR	170	170			290			120-	170
123	ASSOC PROF	4,837	4,837			7,746			2,909-	160
131	SUMMER RES	14,111	14,111			14,111				100
136	RESEARCH FELLOW	41,587	46,323		13,500	50,567			4,244-	109
144						156			156-	
150	A 3	234	234			234				99
151	SECRETARY	6,255	6,255		83	6,337			82-	101
152	CLER	1,610	1,610			133			1,477	8
185	PART-TIME STUDEN	15,150	15,150	532-	801	12,043			3,107	79
190	EB FULL-TIME	18,162	18,162	518-	2,707	19,792			1,630-	108
194	EB PART TIME	1,432	1,432	56-	84	1,121			311	78
	PERSONNEL SVS	140,136	144,892	2,873-	26,332	154,051			9,159-	106
200	TRAVEL	10,000	11,700		1,693	11,465			235	97
210	OFFICE SUPPLIES	300	300		100	210			90	70
211	RSCH SUPPLIES	8,113	7,613	100	305	2,676			4,907	35
213	RSCH SUPPLIES	88	88			88				100
215	SUPPLIES	60	60			60				100
229	TUITION	50,675	50,675	750	3,190	51,080		121	405-	100
232	MAINTENANCE	7,812	6,612			4,812			1,678	74
233	NON-UNIV TRAVEL	381	381			381				100
243	COMPUTER	27,967	27,967			27,467			500	98
260	EQUIP	134,865	127,065	218	218	126,782			283	99
281	PUBLICATIONS	103	103			103				100
288	DUPPLICATING	2,126	2,126		17	1,689			437	79
290	MISC	800	800			800				100
292	POSTAGE	1,432	1,432		306	1,174			258	81
293	TELE	250	250		2	12			238	4
	OTHER EXP ST	244,972	237,172	1,068	5,831	228,799		121	8,251	96
302	TELE	249	249		697	858			609-	344
304	PHY PLANT	55	55			55				100
306	MAIL	100	100			15			85	14
	UNIV SV ST	404	404		697	929			525-	229
	TOTAL DIR EXP	385,512	382,468	1,805-	32,860	383,780		121	1,433-	100
404						150-				

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EXP. DATE 06/85

DEPT NO. 11177 JUN 1982 JUN 1985

BADLER,N

BA M60 TOWNE BLD

GEO. LOC.=D2 DEPT.=11177

CENTER=13

SUMMARY REPORT OF

GRANT AND CONTRACT EXPENDITURES  
IN WHOLE DOLLARS, FOR 04/85

PURPOSE = 01 ACC PAGE 2

SUB CODE	DESCRIPTION	ORIGINAL PROJECT BUDGET	CURRENT PROJECT BUDGET	-----A-----C-----T-----U-----A-----L-----					% ACTUAL
				CURR. MO.	FYTD	PTD	COMMITMENTS	ENCUMBRANCES	
410	OVERHEAD	129,629	132,673		18,461	133,066			393-
	*TOTALS*	515,141	515,141	1,805-	51,321	516,696		121	1,676-
									100
									100

CURRENT MONTH TRANSACTIONS ARE ON A SEPARATE PAGE. QUESTIONS CONCERNING THIS REPORT AND/OR TRANSACTIONS SHOULD BE BROUGHT TO THE ATTENTION OF RESEARCH ACCOUNTING FOR GRANTS AND CONTRACTS; AND GENERAL ACCOUNTING FOR ALL ELSE.



NAS9-16634  
5-22804

PAGE 4600

COMPUTER DATE 05/02/85  
TIME OF DAY 13:44:53

UNIVERSITY OF PENNSYLVANIA ACCOUNTING SYSTEM REPORT  
(C15542L - AU090)

F INDICATES ACCOUNT IS FROZEN AND L INDICATES A DETAIL LINE ITEM ACCOUNT

EXP. DATE 06/85

DEPT NO. 11177 JUN 1982 JUN 1985

BADLER, N  
BA M60 TOWNE BLD  
GEO. LOC.-D2 DEPT.-11177

CENTER-13

OPEN COMMITMENT STATUS  
FOR 04/85

PURPOSE - 01 ACC PAGE 3

ACCOUNT	REF	DATE	DESCRIPTION	ORIGINAL AMOUNT	CURRENT	AMOUNT	LAST ACT	REF NO	TRANSACTION COMPLETED
5-22804-211	E092355	09/06/84	GRINNELL SYSTEMS	100.00		0.00	04/03/85		TRANSACTION COMPLETED
5-22804-232	E085755	07/23/84	DIGITAL	121.44		121.44	07/23/84		TRANSACTION COMPLETED
5-22804-260	E092355	09/06/84	GRINNELL SYSTEMS	500.00		0.00	04/03/85		TRANSACTION COMPLETED
			* ACCOUNT TOTAL *	0.00		0.00			COMMITMENT TOTALS
			* ACCOUNT TOTAL *	721.44		121.44			ENCUMBRANCE TOTALS

BADLER,N  
BA M60 TOWNE BLDG  
GEO. LOC.-D2 DEPT.-11177  
EXP. DATE 06/30/85 PURPOSE=07  
CENTER=13 REPORT OF EXPENDITURE TRANSACTIONS FOR 04/30

DEPT. NO.11177

SUB CODE	DESCRIPTION	DATE	REF NUMBER	TRANS IDENTIFICATION	BUDGET ENTRIES	CURRENT EXPENDED	COMMITMENTS	ENCUMBRANCES	FTD	PAYROLL
100	KOREIN,JONATHAN	12/31	066383458	41-000001						12,724.98
	KOREIN J	12/31	066383458	41-000008						2,120.83-
	KOREIN J	11/30	066383458	41-000048						1,767.36-
	KOREIN J	11/30	066383458	41-235048		1,767.36-				8,836.79
100	CM TOTAL RESEARCH SPECIAL					1,767.36-				
105	TAYLOR-WILKINSON	09/30	199186769	41-000001						320.64
105	GM TOTAL CLERICAL									320.64
136	LIBOWITZ,SKONA	12/31	023424440	41-000001						3,000.00
	GANGEL,JEFFREY S	12/31	125426057	41-000001						4,999.98
	FISHWICK,PAUL AN	12/31	174485334	41-000001						5,499.96
136	CM TOTAL RESEARCH FELLOW									13,499.94
151	SIMONDS,ELAINE	07/01	211384170	41-000003						208.86
	SIMONS E	08/12	211384170	41-000028						84.20-
	SIMONDS E	09/23	211384170	41-000048						42.10-
151	CM TOTAL SECRETARY									82.56
185	ROVINS,JANE	02/17	196465759	41-000004						1,312.50
	KATZ,LAURI ANNE	10/21	262790097	41-000004						20.00
	ROVINS JANE	02/17	196465759	41-000088						532.00-
	ROVINS JANE	03/03	196465759	41-232788		392.00-				
	ROVINS JANE	02/17	196465759	41-232788		140.00-				
185	CM TOTAL PART-TIME STUDEN					532.00-				800.50
190	EMP. BENEFIT FT	04/27	000000	61-000015		517.83-				
190	CM TOTAL EB FULL-TIME					517.83-				
194	EMP. BENEFIT PT	04/27	000000	61-000015						
194	CM TOTAL EB PART TIME									
200	CM TOTAL TRAVEL					55.86-				
						55.86-				
210	CM TOTAL OFFICE SUPPLIES									
211	COMTAL 3M	1595	03/26	092355	42-D53387	100.00		100.00-		
211	CM TOTAL RSCH SUPPLIES					100.00				
229	KOREIN S BATCH L/	04/03	000000	62-118166		750.00				
229	CM TOTAL TUITION					750.00				
260	COMTAL 3M	1595	03/26	092355	42-D53387	218.00				
260	CM TOTAL EQUIP					218.00				
								500.00-		
								500.00-		

ORIGINAL PAGE IS  
OF POOR QUALITY

BADLER, N  
BA M60 TOWNE BLDG  
GEO. LOC.-D2 DEPT.-11177  
EXP. DATE 06/30/85 PURPOSE=01  
CENTER=13 REPORT OF EXPENDITURE TRANSACTIONS FOR 04/30

DEPT. NO. 11177

SUB CODE	DESCRIPTION	DATE	REF NUMBER	TRANS IDENTIFICATION	BUDGET ENTRIES	CURRENT EXPENDED	COMMITMENTS	ENCUMBRANCES	FID	PAYROLL
288	CM TOTAL DUPLICATING									
292	CM TOTAL POSTAGE									
293	CM TOTAL TELE									
302	CM TOTAL TELE									
410	CM TOTAL OVERHEAD									
*** ACCOUNT TOTAL ***					0.00	1,805.05-	0.00	600.00-		23,540.43

MONTHLY CERTIFICATIONS HAVE BEEN REPLACED BY PERSONNEL ACTIVITY REPORTS.